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DIARRHŒA AND CHOLERA:

THEIR

ORIGIN, PROXIMATE CAUSE, AND CURE,

THROUGH THE AGENCY OF THE NERVOUS SYSTEM,

BY MEANS OF ICE.

BY

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## PREFACE.

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A LARGE number of lives are now being destroyed in England, as well as in other parts of the world, by diarrhœa; that especially fatal form of the malady called choleraic diarrhœa has already had many victims; and cholera itself, having been several times recognized as now among us, is causing grave apprehensions lest English cities should soon be included in the list of those which the pestilence has invaded in full force.

Believing, as I do, that the destructive effects of these diseases might be averted by the remedy proposed in the following pages, I print them at once, without waiting, as I had intended to do, until I should have fully explained my views concerning the pathology or proximate cause of cholera, as I have already done concerning that of diarrhœa.

For an exposition of the general principles of vaso-motor therapeutics, of which the treatment of diarrhœa and cholera here proposed is merely one application, I refer readers to the *Introduction* to my pamphlet entitled *Sea-Sickness: its Nature and Treatment*.

LONDON, 25 SOMERSET STREET, PORTMAN SQUARE,  
*August 16th, 1865.*

## DIARRHŒA AND CHOLERA.

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IN discussing diarrhœa I shall arrange its different forms according to my conception of their causes—viz., as follows :

1. *Diarrhœa originated by Heat.*
2. *Diarrhœa originated by Motion.*
3. *Diarrhœa originated by (Electricity or its analogue) Nervous Irritation.*
4. *Diarrhœa originated by the Mind (Emotion).*

*Section 1.*—*Diarrhœa originated by Heat* comprises the Premonitory diarrhœa of cholera, and the ordinary Summer diarrhœa of temperate climates. These maladies, as I shall endeavor to show, are essentially the same, both in nature and origin, and are capable of being cured by one and the same treatment. Assuming their pathology to be identical, an exposition of the proximate cause of the one will of course serve for that of the other.

*Diarrhœa premonitory of cholera* is often the only symptom observable during two or three days immediately before the more fearful aspects of that disease present themselves, and is remarkable by the



fact that it is generally painless. Hence it is that the onset of cholera, in a large number of cases, is peculiarly insidious, the patient very naturally supposing that some irritating material in the bowel is causing slight flux, which, being without pain, will probably soon subside, and calls for no especial medical attention. Now, if the diarrhœa were really caused by irritating ingesta, it is reasonable to suppose that the reflex action induced by them would result in sensations, more or less pronounced, of the nature of griping and colic: the intestinal contractions would be most likely to be not only especially vigorous, but concentrated both in time and intensity, and would therefore cause the bowel to pass along the offending material with undue force, thus originating the pains common in such cases. But in the diarrhœa of cholera, if the hypothesis which I am about to introduce be correct, the order of causation is reversed: in the majority of cases, the dorsal nervous centers, and those in intimate connection with them which directly govern the alimentary canal, become suffused with blood much more copiously than is natural by the stimulant effects of the excessive external heat in hot climates, and of temperate climates in summer, and most rapidly by the direct rays of the sun on the back of the patient. The result upon the intestinal canal may be stated as follows:

(a) The blood-vessels nourishing the tube receive a larger supply of nervous influence from the vasomotor nerve centers than before, and hence, *con-*

*tracting* more vigorously than natural, cut off to a proportionate extent the supply of blood to, and consequently the nourishment of, the intestinal walls. The bowels thus lose their wonted robustness, and so become, like a delicate lady with very little blood in her system, "highly nervous," and susceptible of being excited and thrown into excessive or convulsive activity by a stimulus which, in their healthy condition, would but slightly affect them.

(b) I have pointed out, in my pamphlet on Sea-Sickness, that when the skin of patients suffering from that malady is most blanched and bloodless, sweat exudes from it most copiously; I have also, for the first time, pointed out that in the first stage of bronchitis, when the bronchial mucous membrane is so swollen, from the abnormally large amount of blood circulating in it, as seriously to impede respiration, and when, at the same time, it is completely and painfully dry, the application of heat between the scapulæ, by rendering the vaso-motor nerve centers more active than before, will not only stimulate the blood-vessels of the bronchial mucous membrane to contract, thus lessening the amount of blood circulating in the walls of the air-tubes and causing respiration to become much easier, but, simultaneously, will cause bronchial mucus to be freely secreted. Arguing analogically, I was led to the conclusion that when, by applying heat to the back, nausea is induced, the proximate cause of that nausea is the secretion of an abnormal amount of mucus in the stomach; and I was led to the further conclusion

that heat thus applied will also increase the secretion of mucus throughout the intestinal canal. Acting on this conviction, I have in certain cases of constipation indubitably accompanied, and, as I believe, caused, by a great want of intestinal mucus, overcome the constipation by the application of heat in the dorso-lumbar regions. Hence I believe myself justified in asserting that, in the premonitory diarrhœa of cholera, the flux is considerably increased by a copious exudation of mucus in the manner here explained.

(c) Assuming the truth of the foregoing propositions, we see not only the source of a portion of the choleraic flux, but also how the bowels have become in a condition rendering them peculiarly susceptible to that nervous influence which causes their peristaltic contractions, and thus the preternaturally frequent and rapid expulsion of their contents. Now, precisely those hyperæmic conditions of the nervous centers presiding over the bowels, which have resulted in the two groups of phenomena already explained, also induce an excessive exaltation of the excito-motor or reflex functions of those nervous centers, and thus cause them to transmit their stimulating influence to the muscular fibers surrounding the bowels with a copiousness and intensity far surpassing the normal amount. Hence these circular muscles, enfeebled, but rendered peculiarly excitable, as explained, contract far more rapidly and vigorously than usual.

The association of these three conditions, viz.,



enfeeblement of the muscular wall of the intestine, preternatural exudation from its mucous membrane, and excessive muscular activity—all dependent, as I have shown them to be, upon hyperæmia of the nervous centers, constitutes the premonitory diarrhœa of cholera, and, indeed, all those choleraic forms of intestinal flux known as the Summer diarrhœa of temperate climates. I may add, that while the hypothesis here propounded accounts for all the phenomena of the maladies in question, it receives striking confirmation, not only from the experience which I have already had in treating cases by means of ice along the spine, but also from the fact that I have induced diarrhœa by applying heat to the dorso-lumbar\* region.

*Summer diarrhœa* is, in fact, cholera in its first stage, and only needs a further rise of atmospheric temperature to become developed into its characteristic and fatal form. Indeed, in those years when cholera prevails, diarrhœa is not only increasingly frequent, but is sometimes as fatal as cholera itself. "The largest total annual mortality from diarrhœa in England occurred in 1857, when the deaths from this cause numbered 21,189, the deaths from cholera

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\* I have under my care a lady suffering from long-protracted hemorrhage from the bowels. The chief feature of my treatment, which has been extraordinarily successful, has consisted in the application of heat to the dorso-lumbar region, by means of the spinal water-bag. After using the bag some weeks, diarrhœa came on: it ceased when the bag was omitted, and recurred so decidedly each time when it was used again, that I was obliged to suspend its use altogether for a time.

being 1150. In 1854, when the mortality from the latter disease was 20,097, the deaths from diarrhœa amounted to 20,052.”\* Even as it shows itself in England during those summers in which no suspicion of the presence of cholera exists, it numbers many victims. In the course of some clinical remarks by Dr. Greenhow, at Middlesex Hospital, reported in the *Medical Times and Gazette*, July 22d, 1865, he said: “The mortality from this disease during the past week had been greater than during any corresponding week of the last twelve years, more than double that which took place during the corresponding weeks of any one of the years 1857, 1858, and 1859, when diarrhœa also caused a very large mortality, and more than five times as great as that during the same week of either of the years 1853 and 1854, in which the last epidemic of cholera occurred.”

If the symptoms in every case of Summer diarrhœa were carefully watched, instances would not seldom be found in which its indubitable kinship with cholera would be easily recognized. Indeed, few English summers pass in which cases of clearly attested cholera do not occur—cases developed in different districts remote from each other, at times when what is called “epidemic cholera” does not exist either in England or in any adjacent countries, and when, therefore, the most enthusiastic “contagionist,” or advocate of a “cholera miasm,” is trou-

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\* The *Lancet*, July 22d, 1865.

bled to account for the appearance of the disease. Dr. Greenhow states that "in the cases of diarrhœa which he had lately seen, and especially in those among children, the purging had for the most part been profuse, watery, and attended by much prostration. The pallor and anæmia which ensued, even after a brief attack, were indeed very remarkable. He had seen no case as yet this season to which the term malignant or Asiatic cholera could properly be applied; but in a few instances there had been vomiting and cramps, and the cases resembled what was called by Sydenham cholera morbus, and had since been termed Summer cholera." I may add that cases of true cholera (one at Guy's Hospital) are reported to have already occurred.

On the other hand, it is well known that in cholera countries, when cholera is rife, many cases of diarrhœa, which subside instead of developing to the full proportions of cholera, present themselves—cases in which the patients recover when no medical aid has been used, and which therefore cannot be regarded as cholera cut short by art, but which are, in fact, identical in all respects with the diarrhœa which prevails more or less, according to the rise and fall of temperature, in summer, throughout Europe.

It is commonly believed that Summer diarrhœa is mainly caused by the eating of fruit, which is, of course, much more abundant in summer than winter. It is probable that in numerous cases this is an *exciting* cause of the malady; but I venture to assert

that if this exciting cause were equally operative in winter as it is in summer, it would be very far from equally *efficient*, and that its efficiency in summer depends almost wholly upon the hyperæmic state of the nervous centers generally along the back, and specifically of those presiding over the nourishment and functions of the alimentary canal. These, by the excess of blood in them, are predisposed to abnormal excitement. Then, and not until then, fruit taken into the stomach may readily become an exciting cause of diarrhœa. Moreover, thousands of persons who abstain from fruit, and who are wholly incapable of accusing themselves of committing irregularities of any kind in respect to diet, are, nevertheless, attacked with Summer diarrhœa. They are at a loss to account for their sufferings; and hence ascribe them either to the influence of some mysterious, inscrutable agency, or (and indeed very commonly) to the action of the great heat in summer in some way unknown. This wide-spread adumbration or instinctive notion of the cause of the malady is almost as remarkable and interesting as the complete empirical anticipation by the Swiss mountain guides of what I have designated vaso-motor therapeutics.

If the proximate cause of the two kinds of diarrhœa now in question be what I allege it to be, the hyperæmic state of the vaso motor nerve centers induced by the heat must effect a diminution in the amount of blood in the *peripheral* arteries—not only of the bowels, but of the whole body; for the con-



tractile force exerted upon the arteries generally will lessen their diameters, and will thus lessen the blood-currents supplying the capillary vessels throughout the system. It follows, necessarily, that the pulse will become feeble; that, textural nutrition being lessened, the animal functions will be impaired, and a sense of weakness and lassitude will be induced; and that, as the vital chemistry in every part of the structure proceeds less rapidly than before, because the lessened blood-currents supply less chemical materials than before, the amount of heat evolved will be lessened, and consequently the temperature of the surface of the body will fall. As a matter of fact, a feeble pulse, weakness, and chilliness are ordinary features of diarrhœa. They are summed up by Dr. Copland as follows: "At an advanced period the pulse is usually small, weak, and somewhat accelerated: the countenance being pale, the body somewhat emaciated, the strength diminished, and the skin dry and very sensible of cold." The bowels being the chief seat of disturbance, it is intelligible that the whole of the abdominal segments of the body, including the walls of the cavity, should be especially affected. Hence not only the "very disagreeable sinking sensation in the abdomen" mentioned by Dr. Wood, but the sense of cold, especially felt in that region, which causes sufferers to resort to the use of hot stomachic stimulants, and which in Sweden, where diarrhœa is peculiarly prevalent, has led the peasants to adopt the plan of wearing, blacksmith-like, long leather aprons, which cover the



breast and reach to the knees.\* In a case of diarrhœa recently under my care the surface of the abdomen was remarkably cold: the contrast between its temperature and the higher temperature of the adjacent regions, especially that of the chest, was very striking.

*Section 2.—Diarrhœa induced by Motion.* The most eminent physicians are now in the habit of speaking of heat as a mode of motion. The hypothesis already put forward affords a physiological

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\* "The principal sicknesses here are low fevers, colds, agues, and diarrhœa. Diarrhœa is very prevalent. The best cure I know is a handful of peppercorns, washed down with a glass of brandy. The peasants here adopt an excellent plan. They all wear long leather aprons, like blacksmiths, which cover the breast and reach to the knees. The great thing is to keep the stomach warm in winter, and I would always recommend the stranger who is much exposed to the weather here, to wrap a shawl or flannel round his body under his clothes."—*Ten Years in Sweden*. By "AN OLD BUSHMAN." London, 1865.

Some readers of this note may remark, with much show of reason, that if diarrhœa be so prevalent as stated in Sweden—a decidedly cold country—the fact does not confirm, but is opposed to my hypothesis as to the proximate cause of diarrhœa. This, however, is not the case. Besides diarrhœa, the principal sicknesses in Sweden are said to be low fevers, colds, and agues. Now all these maladies involve great disturbance of the vaso-motor nerve centers, but ague during the cold stage consists in their decided congestion; and when once this is established, whether by heat or other causes, a predisposition to diarrhœa is also established in the manner I contend for. Hence ague and diarrhœa are likely to be near neighbors, and, indeed, to attack alternately the same patient.

illustration of this conception; and conversely, motion, in the human organism, may, for all practical purposes, be regarded as the equivalent of heat. The diarrhœa which frequently accompanies sea-sickness is an illustration of this truth. For an account of the pathology of sea-sickness, the reader is referred to my pamphlet on that subject; but with respect to the diarrhœa sometimes associated with it, I will state here how I believe it to be induced. The motion of the ship is communicated to the abdominal and pelvic viscera, which, rising and falling, coming in more or less violent concussion with each other and with the abdominal walls, and having their contents also violently moved to and fro, thus receive an enormous number of abnormal impressions: these are conveyed to the superior and inferior mesenteric nervous plexuses, which transmit the complaint to the vertebral ganglia of the sympathetic. They forward it along the *rami communicantes* to the spinal cord, which, if thus excited to a considerable degree, sends unusually energetic motor impulses in the reverse direction to the circular muscles along the complaining organs. Hence these muscles contract with excessive vigor, and, co-operating with the preternaturally active mucous membrane, and other secreting organs along the alimentary canal, induce diarrhœa. It will be seen that in this case motion originates irritation; irritation, propagated to the nervous centers through the sensory nerves, causes an unwonted afflux of blood in those centers, their functional power becomes thereby increased, and,

consequently, their reflex actions become proportionately more numerous and intense. The conditions of the nervous centers in question thus induced by motion are closely analogous to those which in choleraic diarrhœa are induced by heat; and the results, so far as the bowels are concerned, though less in intensity, are the same in kind as those which heat produces. It is, I apprehend, probable that the reason why, in cases of sea-sickness, one person suffers from diarrhœa and another does not, is that in those who do thus suffer the special segments of the nervous system, which preside over the nutrition and functions of the bowels, are especially feeble and excitable, and therefore peculiarly liable to derangement.

*Section 3.—Diarrhœa induced by (Electricity or its analogue) Nervous Irritation.* Diarrhœa arising from the irritation of dentition, from irritating ingesta, from drinking impure water, from inhaling noxious gases, from ulceration of the bowels (as in phthisis), and the symptomatic diarrhœa of numerous diseases, are forms of the malady in which its primary cause operates in the first instance on the mucous membrane of some part of the alimentary canal the nerves of which are irritated: the nerve currents (probably electric) to the sympathetic nerve centers and to the spinal cord are greatly increased in number and intensity; these organs, being thus unduly excited, receive an extraordinary afflux of blood; their functional power is proportionately exalted;

their reflex activity is intensified, and the phenomenon of intense reflection along the alimentary tract—diarrhœa, often associated with nausea and vomiting, pallor, coldness of the surface, feeble pulse, weakness of all grades, and, in its extreme form, with fatal collapse—necessarily ensues. In all these instances, however diverse the *primary* cause of the disease, the *proximate* cause is always the same, and is identical with that of those forms of diarrhœa reviewed in sections 1 and 2,—viz., hyperæmia of the spinal and sympathetic nervous centers, including especially the mesenteric plexuses.

*Section 4.—Diarrhœa induced by the Mind (Emotion).* Among the most remarkable and decisive proofs that the *proximate* cause of diarrhœa has its seat in the nervous system is the well attested and indeed often observed fact that the disease is inducible by mental emotion: mental shocks of various kinds (especially fright) frequently produce it.

The following facts I am able to authenticate:

(1.) A woman who has a drunken husband suffers great anxiety when he is away from home, especially if late at night, lest anything should happen to him, and particularly lest by a fall or other accident he should receive bodily harm. This anxiety brings on diarrhœa, accompanied with trembling, pallor, and a peculiar haggardness of countenance.

(2.) A lady who, while crossing the Atlantic, suffered fearfully from sea-sickness and violent diarrhœa during the whole passage, has since her mar-

riage been troubled with diarrhœa almost always when she has experienced painful emotions. On almost every occasion when her husband is unkind to her, as he is wont to be, she has a violent attack of diarrhœa.

(3.) A woman suffers from diarrhœa whenever her feelings are vehemently excited, even although the excitement may be one of sudden pleasure.

(4.) One of my patients, who was reading George Eliott's noble work "*Romola*," assured me that the emotions it excited in her brought on diarrhœa! In fact, owing to this remarkable transformation of emotions into "motions," she was obliged for a time to abstain from reading the book.

(5.) A lady, one of my patients, when affected by any violent emotion, especially if of a distressing character, is almost immediately attacked with diarrhœa, or vomiting, or both.

In these cases congestion of the nervous centers appears, physically speaking, to be the primary fact. But I apprehend that the order of causation is as follows: Terrifying or exciting impressions, suddenly communicated, are conveyed to the sensory ganglia, and are thence distributed to the cellular structure constituting the cerebral convolutions; these are thrown into tumultuous excitement, which is propagated along the motor tracts with the rapidity of lightning down the whole spinal axis, and laterally to the ganglia of the sympathetic; these, becoming suddenly swollen with blood, instantly act with intensely vehement energy, and diffuse their



subtle stimulus in all directions. As the source of the powerful impressions which they have, in this case, received, is cerebral, so the *chief* direction in which the vaso-motor impulses are reflected is toward the brain: hence, quick as thought, the cerebral arteries are contracted with preternatural energy, and thus, in extreme cases, the brain being rendered comparatively bloodless, the person is stunned as if by a blow; the face becomes pallid, cold sweat sometimes exuding from it; if consciousness is not abolished, mental power is still greatly enfeebled, and, by the same agency and in the same manner as the phenomena of ordinary diarrhœa are induced, the strength of the whole muscular system is impaired, the temperature of the surface of the body is lowered, the muscular wall of the intestines is enfeebled, their mucous membrane exudes its appropriate secretion superabundantly, their peristaltic action becomes excessive, and thus diarrhœa originating in mental emotion is clearly due to the same proximate cause as that on which, as I have endeavored to show, all forms of the malady depend.

*Treatment.*—The foregoing review fairly demonstrates, I believe, that whatever may be the primary or ultimate causes of the various forms of diarrhœa above mentioned, the proximate cause of all is the same, viz., hyperæmia, more or less excessive, of those nervous centers which preside over the bowels, and notably, therefore, of the superior and inferior mesenteric plexuses. It follows logically that if we

could exercise a sedative influence over those centers by lessening the amount of blood in them, we should be able to avert, control, or cure diarrhœa. Considering the secluded position of the mesenteric plexuses, placed as they are within the abdominal cavity, it seems, at first sight, improbable that we should be able to influence them by means of external applications. As a matter of fact, however, it is possible to lessen the amount of blood in nervous segments along the back at a considerable distance above or below those particular segments over which ice is applied. It is, indeed, a physiological fact, so regular in its recurrence that it may be denominated a law, that when one nervous segment is rendered either anæmic or hyperæmic, the adjoining one will assume a like condition, though in a lesser degree, while those further removed will, in proportion to their nearness, also participate in the state impressed on the one first affected. It is, therefore, easily conceivable that nervous centers placed in a direction inward from the point where ice is applied, may be influenced indirectly in the same manner as are those dorsal segments above or below the point of application. Moreover, as there is good reason for believing that the spinal cord itself, as well as those dorsal segments of the sympathetic from which the splanchnic nerves are derived, is intimately related functionally to the abdominal viscera, a direct sedative influence is, if this be the case, capable of being exerted by the application of ice along appropriate segments of the spinal region, while that in-

fluence is propagated indirectly to the mesenteric plexuses; and thus the whole nervous centers involved being supplied with less blood than before, are thereby rendered incapable of continuing those preternatural actions on which the production and continuance of diarrhœa depend.

These considerations led me to treat diarrhœa by the application of the spinal ice-bag along the lumbar and lower dorsal regions in all cases; and when the cerebral and thoracic conditions are such as to permit the exertion of a sedative influence along the cervical and upper dorsal region, to avail myself of the great additional power which may be exercised by applying ice in each cell of the bag at once along the whole spine. The application, in cases where there are no special reasons to forbid it, should be continued until the diarrhœa is subdued, and should afterward be repeated two or three times daily until the patient's strength is quite recovered.

I freely recognize that this method of treatment requires a long-continued trial before it can be regarded as an established curative agency of the high scientific order in which I confidently hope it will ultimately rank, and as yet my own experience in thus treating diarrhœa is comparatively slight. I have, however, as stated in my pamphlet on Sea-Sickness, ascertained by experience that the diarrhœa which sometimes accompanies that malady is arrested by means of ice: this fact has been proved in several cases. I have also treated several cases of Summer diarrhœa in like manner, and with like

success: and the infantile diarrhœa occasioned by dentition can, as I have also experienced, be subdued with wonderful rapidity in the same way. In these cases this particular symptom of spinal irritation, diarrhœa, is not only subdued, but the restlessness, fretfulness, and general irritability of the little sufferer are simultaneously overcome. Soon after the ice is applied along the back, the child usually goes fast asleep with the ice on, and when it awakes is refreshed and calm, the diarrhœa having quite ceased meanwhile. Such being the result in such cases, I feel justified in predicting that if in all instances of preternatural excitability while teething, ice were properly and adequately applied along the spine, those disastrous effects of dentition which are now frequent—viz., convulsions, often ending in permanent epilepsy and paralysis, which, though sometimes only temporary, is not seldom persistent, and associated with arrest of growth of the affected limbs—would be wholly averted. I may add that, as in children the vascular system is in its maximum state of activity, ice can be borne by them for a much longer time with impunity than is the case with adults.

I append a report of the treatment of two cases of Summer diarrhœa which have just occurred :

July 22d, 1865, 11 A.M.—Mrs. J., aged about sixty, was suffering from diarrhœa. Her bowels had been already moved that morning four or five times. She complained of feeling excessively “low,” and of

slight pain in the bowels. She was remarkably pale, and looked very ill.

I ordered ice to be applied in each cell of the spinal ice-bag, and to be continued until the symptoms should subside. Ice was applied forthwith, but only during one hour. From the time the bag was applied until 8 P.M. the bowels were never moved, and no pain was felt.

Meanwhile, she was extremely excited and troubled by hearing a piercing scream from a lady in the same house, who had been seriously hurt. At 8 P.M. the diarrhœa recurred, the bowels being moved again three times. At 9.30 the patient went to bed, and again applied the spinal ice-bag. She lay upon it, and fell asleep; in about an hour she awoke, removed the bag, and from that time slept continuously till 6 o'clock the next morning.

July 23d.—Between 7 and 11 A.M. the diarrhœa returned vehemently, the bowels being moved six or seven times; the arms and hands broke out into a cold sweat; the face was sunken; and the patient felt so ill as to be seriously alarmed, and to propose telegraphing for me from the country, whither I had gone on Sunday.

At 11 A.M. ice was again applied as before. During the first ten minutes the sense of cold which had been experienced during the morning, before the ice was applied, seemed to increase; but at the end of that time the patient suddenly became "hot." "I felt," she said (July 25th), "a glow of heat all over me, which has continued ever since." Meanwhile,



she has had no return of the diarrhœa, and, except that she has been weakened by the attacks, has felt quite well in all respects.

July 24th, 1865.—C. J., aged forty-four, has not felt quite so well as usual during the last few days, and the bowels have been open more freely than usual. This morning he had a decided attack of diarrhœa. A three-celled spinal ice-bag was applied along the whole spine. At the time of its application he felt an urgent need of relief to the bowels by another motion; but the first effect of the ice was to cause that urgent feeling to subside. Only in half an hour afterward were the bowels again moved; and from that time he has not experienced another unpleasant symptom.

## CHOLERA.

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HAVING hastened the publication of this pamphlet, I have been unable, on this occasion, to develop my views concerning the origin, proximate cause, and rational treatment of cholera. I have, however, in the foregoing paper, given what I confidently believe to be the key which will reveal the whole mystery of that hitherto inscrutable and irremediable disease. I hope shortly to explain my ideas on the subject, but will at once append here a summary of the doctrines which I hold.

1. That the *primary* cause of cholera is, as a general rule (liable to exceptions which will be indicated), the excessive heat of hot climates, and of temperate climates in summer when cholera prevails.

2. That the *proximate* cause of cholera is of precisely the same nature as that of summer or choleraic diarrhoea, but that it is far more developed, and consequently that its action is proportionately more powerful and intense.

3. That the general arterial contractions effected throughout the system by the vehement operation of the cause in question, viz., *extreme hyperæmia* of

*the spinal and sympathetic nervous centers*, by depriving the capillary vessels in all parts of the body of their wonted supply of blood, induce the muscular debility, tremors, vertigo, impairment of respiration, cold breath, sense of faintness, coldness of the whole surface of the body, coldness and lividness of the lips and tongue, blueness of the entire surface of the body, the sunken and appalling countenance, and the fatal collapse characteristic of the disease.

4. That the nausea, vomiting, copious discharge of the well-known "rice-water stools," cold sweat, and peculiar odor from the body, are due to the combined action of the hyperæmic spinal cord and sympathetic nervous centers, in the same manner as they induce phenomena of the like kind, though less in degree, in cases of summer diarrhœa, and of seasickness when it is accompanied with diarrhœa. (See my Exposition of the Pathology of Sea-Sickness.)

5. That cholera is neither contagious nor infectious in any sense whatsoever, except through the depressing influence of fear.

6. That cholera may be completely averted, and, when developed, cured by the persistent application of the spinal ice-bag along the whole spine so long as any symptom of the disease continues.

The publication of the exposition which I am preparing of the pathology of cholera is, as already said, necessarily deferred; but, as hundreds of victims are now being sacrificed to the disease weekly, I lose no time in publishing such directions for its

treatment as are, I feel confident, most likely to arrest its progress.

*First.*—As soon as the symptoms of cholera show themselves, apply the spinal ice-bag next to the skin, along the central line of the back, letting it extend from the upper cervical to the lower lumbar vertebræ, or from the nape of the neck to the lower part of the small or hollow of the back; and let the bag be closely pressed to the patient's back by means of his clothes or special bands, or, best, by causing him to lie upon it.

[The bags are made of various lengths, viz., 10, 12, 14, 16, 18, 20, 22, 24, and 26 inches long, and increase in breadth in proportion to their length. If a bag is procured of a length suitable to fulfill the conditions mentioned, its breadth, being proportionate, will be suitable also. The necessity of observing these proportions is, for physiological reasons, extremely important. In order to prepare the bag for use put ice (broken into pieces about the size of a small walnut\*) into the opening of the bag, on the side nearest to the loops, until the contents of the lowest cell reach up to the bottom of the second cell; then put ice in the middle opening until it reaches up to the bottom of the third cell; and, finally, fill the top cell. Then close the bag with the clamp, placing it on the thickened, band-like

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\* This is most easily done by means of an "ice-breaker," supplied by ironmongers, and consisting of a tapered piece of steel, sharp-pointed, and fixed in a handle.

part around the mouth, and letting the screws be on the same side as the loops of the bag, each of which must be turned outward. *It is of the utmost importance that the bag be filled in this manner;* otherwise there might in the middle third part of it be two, and in the upper third three, layers of India-rubber between the ice and the patient's back. Care must be taken that each cell is not so filled as to cause it to become round, otherwise only a small portion of the bag will touch the back. It is also essential that the contents of the several cells should not overlap each other.

[As ice contains a considerable amount of air, this air, as the ice melts, accumulates at the top of the bag, and, being a bad conductor of heat, prevents the still unmelted ice which it surrounds from exerting its intended influence; it is, therefore, necessary to unscrew the clamp occasionally, in order to let the air escape; and if the bag is to be worn for a considerable time, to replace the air by a little fresh ice.]

*Second.*—Keep the bag applied as directed so long as vomiting, purging, cramps, coldness of the surface of the body, or any signs of collapse continue.

[Each bag of ice will last from an hour and a half to two hours and a half in summer. It is important to remove the bag before the water in it becomes warm, and immediately to refill it with ice. If the bag be allowed to remain on the back after it becomes warm, the India-rubber of which it is made



tends to increase rather than diminish the heat, and, therefore, the hyperæmia of the spinal region.]

*Third.*—If, after the bag has been applied some time and the symptoms of the disease are subsiding, a special afflux of blood to the head, chest, or womb should occur to an extent causing pain—or, in the case of the lungs or womb, the threat of hemorrhage—care must be exercised so to regulate the force of the ice in relation to those particular nervous segments along the spinal region, which preside over the vascular system of the parts implicated, as to avert the consequences which might otherwise ensue. [Such results, however, will, under any circumstances, be of rare occurrence.]

*Fourth.*—When the skin has become thoroughly warm, and the stage of reaction has set in, guard against the advent of fever or local congestions, by applying the double-columned spinal water-bag, at a suitable temperature, along the whole or the specially appropriate part of the spine, according to the peculiar exigencies of the case.

[For example, if general feverishness should supervene, apply one long spinal water-bag, or two short ones, along the whole spine, letting the water be at a temperature between 110° and 120° Fahrenheit, and the feverishness will be found to abate: the pulse will fall, and the skin will become moist. In cholera cases it is of the utmost importance to use water of the lowest temperature consistent with achieving the object. Patients differ considerably in respect to the ease and rapidity with which their

nervous systems respond to the application of heat; but if water at  $110^{\circ}$ ,  $112^{\circ}$ , or  $115^{\circ}$  is found effective, the physician should be scrupulously careful to avoid using water of a higher temperature. If any special congestion or inflammation threatens to occur, special applications of heat should be made—in head affections, along the cervical and upper dorsal vertebræ; in chest affections, between the scapulæ; and in abdominal affections, along the lower dorsal and the lumbar vertebræ.]

In the *Lancet* of August 12th, 1865, Dr. Althaus states that “there are facts to prove that the continuous [galvanic] current has a physiological action on the spinal cord and the sympathetic, if applied to the skin of the back by moistened conductors. Thus, we may often cause the iris to contract by directing a current of large quantity to the lower cervical and upper dorsal vertebræ, showing that there is physiological transmission of part of the current to the cilio-spinal region of the cord and the corresponding ganglia of the sympathetic, which preside over the functions of the iris. Again, by applying a continuous current to the lumbar portion of the spine, we may cause a glow in the legs and feet, without any direct application to these latter, showing that the influence on animal temperature, which M. Claude Bernard and Dr. Brown-Séquard have proved to belong to the sympathetic, is brought into play by the application of the continuous current.”

If the interesting fact here announced should be verified by further experience, the application of the direct or galvanic current to the spine will exert the same kind of influence on the spinal cord and sympathetic, and through the latter on the vascular system, as is exerted by the application of ice. The therapeutical consequences of the discovery, if confirmed—as it seems, *à priori*, not unlikely to be—will doubtless prove important. Of course, a galvanic battery is much less available and manageable than a spinal ice-bag; but it may be that even in some rare cases of cholera, where ice is not obtainable and a galvanic battery is, the disease might be at least controlled by the latter.

The general principles—of which the treatment here proposed is an application—dictate, moreover, certain *auxiliary remedies* which ought to be had recourse to in all severe cases; and the same principles forbid, not less distinctly, the use of certain drugs and stimulants not seldom prescribed or resorted to.

1. The operation of the spinal ice-bag in overcoming the vasic spasms generally should be facilitated by keeping the patient thoroughly warm in bed, by means of an ample supply of blankets.

2. Co-operation of the like kind should be afforded to overcome the special coldness (vasic spasms) of the abdomen by the application of heat over its surface. [This I usually do by filling any spinal ice-bags or spinal water-bags I may have at hand with

water at a temperature of about 130° Fahr., and applying them on the coldest parts.]

3. Co-operation of the like kind, and in like manner, by local applications, should be afforded, in order to overcome the special coldness (again vasic spasms) of the hands and feet.

Though these local applications are incapable of arresting the malady, they are more effective than might, *à priori*, be supposed; for they exert a beneficial influence on the nervous centers. In slight cases, where the vasic spasms of the extremities are distinct, but not strong, vigorous friction or heat, so applied to one hand or foot as to make it thoroughly warm, will generally so act on the nervous centers related to the limb as to cause them, by reflex action, to relax the arteries of, and thus to insure warmth in, the corresponding limb. And, deductively, I conclude that this law obtains in every segment of the body.

The importance of making the utmost effort to facilitate the operation of the spinal ice-bag in relaxing the arterial spasms throughout the surface of the body is attested by a fact mentioned to me by Dr. Brinton, viz., that if equal doses of opium be given to two dogs of equal size, and then if one dog be kept in a room at a low temperature, say 50°, and the other in a room of a higher temperature, say 70°, the former will die, but the latter will live. The cause of this difference in the fate of the two animals lies, I doubt not, in the fact that the constricting action of the opium on the peripheral arteries was

assisted by the external cold in the case of the dog placed in the cold room; whereas the same action was impeded by the external warmth in the case of the dog placed in the warm room, and thus the circulation was kept up sufficiently to sustain life until the poison had been excreted or its force expended.

Now, if my hypothesis as to the nature of diarrhœa and cholera be correct, it is obvious that, as in cholera there is coldness of the surface (spasm of the peripheral arteries), induced in a manner analogous to that by large doses of opium, the experiment with the two dogs affords a strong proof that in the treatment of cholera the application of external warmth is likely to aid, to a great extent, in restoring the patient.

4. Non-stimulating fluids, *as hot as can be comfortably borne*, should be taken as freely as possible: milk, barley-water, arrow-root, beef-tea.

These I prescribe as a means of applying heat to the alimentary canal on the same principle as I apply heat to the skin. I have not ascertained the fact by experiment, but believe that the evacuations from both the stomach and bowels of patients suffering from summer diarrhœa and cholera will be found to be of lower temperature than the contents of the alimentary canal are normally.

5. The plan often adopted of giving ice internally, or any cold drinks, should be strictly avoided.

6. Alcoholic stimulants are objectionable; for although their immediate action on the mucous membrane of the alimentary canal is that of a stimu-



lant or irritant, and thus temporarily increases the amount of blood in that membrane, its ultimate action on the nervous system is believed to be such as, if the pathology of diarrhœa here propounded be true, will be likely to prolong and intensify the malady.

7. Strychnia, opium, and all drugs which act as nervine stimulants should be scrupulously avoided.

8. Coffee and tea should, I am of opinion, be forbidden.

I have a strong conviction that coffee is capable of acting very injuriously on persons predisposed to undue action of the automatic nervous centers. I know that in some cases it exerts a peculiar and distressingly exciting influence upon the heart; and as its effect on the kidneys is similar to that of opium, I presume it acts as a stimulant of the spinal and ganglionic nervous centers somewhat as opium does. Moreover, I have been informed of one case in which a cup of coffee acted as a purgative; and it is customary for the Italian peasants, at least in the districts around the Lake of Como, to administer strong coffee containing lemon-juice in cases of dysentery. They have great faith in the efficacy of the remedy. If coffee does act curatively in dysentery, the fact confirms my view of its action. Tea is, I incline to think, less objectionable. But we have still much to learn concerning the action of both these seductive beverages.

All influences—whether intellectual, moral, or physical—which tend to exalt the activity or susceptibility of the nervous system, increase its liability

to derangement, and notably predispose it to those perverted actions called "functional diseases," of which, as I maintain, diarrhoea and cholera are examples. It seems to me probable that among the physical agencies in question, opium, alcohol, coffee, and tea stand conspicuous; that the large amount of opium consumed in Eastern countries, and especially in India, creates in the nervous system a condition peculiarly favorable for the generation of cholera by the solar heat; that this condition, though in a lesser degree, is also induced by the free consumption of alcoholic fluids; and that the increase of cholera in Europe and America within the present century may be referred not only to the increased activity of the nervous system as expressed in the intense excitements, anxieties, and struggles incident to the present phase of civilization, but also to the free indulgence by the people in nervous stimulants of various kinds, including opium chewing, alcoholic drinks of all kinds, and, especially during the present century, to the daily consumption in large quantities of coffee and tea.

I may add here that another powerfully *predisposing* cause of cholera consists, I am inclined to believe, in immoderate indulgence of the sexual appetite, and in all perverted excitations of the reproductive organs. It is well known that undue sexual excitement conduces to the development of diseases of the nervous system, especially to that disease in the action of which the whole system is involved, viz., epilepsy. A chronic congestion or preternatu-

ral excitability of the spinal cord is established; and in this condition, assuming my hypothesis as to the nature of cholera to be true, there exists a special aptitude for the development of that disease by the solar heat. As Asiatic races are peculiarly prone to sexual intemperance, it is not unlikely that this is one of the causes of the frightful destructiveness of the disease among them, and especially in India.

Opium plays, I believe, a part so important as a predisposing cause of cholera, and when administered to victims of the disease in insuring the death of many who otherwise would have recovered, that, without waiting to complete my paper on the pathology of cholera, I am induced to publish at once the following observations on

THE DYNAMIC INFLUENCE OF OPIUM, *considered with especial reference to its effects when administered in cases of cholera.*

The chief or most notable action of the drug consists in causing first hyperæmia and then congestion of the nervous system. How it does this—what abnormal chemical changes occur, what normal chemical changes are impeded or arrested—is not known; as yet our knowledge of the matter is limited to a partial insight into the physiological action of the drug, and this is exerted on the three great divisions of the nervous system in somewhat the same order as is that of chloroform: in man the cerebrum is first involved; then the sensory ganglia;

then the automatic nervous centers, consisting of the spinal cord and the ganglia of the sympathetic. Preluded or not as it may be, according to the patient's idiosyncrasy and the quantity of opium taken, congestion of the cerebrum takes place, and is denoted by mental heaviness, apathy, and inaction. Then, as the effects of the drug deepen, perceptive power gradually declines: the lack luster eye, if opened, tells how indubitably visual power is impaired, and it becomes necessary to shout to make the patient hear. Then total blindness and deafness follow: the closely contracted pupil denotes the complete congestion of the optic ganglia, and the loudest shout evokes no response. Then follow increasingly decisive signs—first of hyperæmia and afterward of congestion of the ganglia of the sympathetic: the arteries of the skin become contracted, thus causing coldness and pallor of the surface, with exudation of cold sweat; the cerebral arteries contract, thus causing cerebral anæmia to succeed to cerebral congestion; the forehead, as well as the face, at first flushed and hot, now becomes deadly pale and cold; the dilatation of the pupil which now occurs denotes not only that the cerebral congestion has ceased, but that the spinal cord has become hyperæmic; the inner skin—the mucous membrane—as may be demonstrated in the case of that lining the bronchial tubes, exudes its appropriate secretion, as the outer skin does, in excessive abundance—in such abundance indeed that in some cases the bron-

chial tubes are filled with it, and the patient dies of suffocation.

The kidneys, unless the bladder is speedily contracted by a very large dose of the drug, exude an excessive abundance of urine—a fact which I am prepared to show is induced by nervous hyperæmia; and there is not unfrequently involuntary expulsion of urine and fæces. It may be that the exertion of the poisonous influence on the cardiac ganglia helps to impede the action of the heart, but the extreme slowness and weakness of the pulse in cases of opium-poisoning is adequately accounted for by the arterial spasms obtaining throughout the body: the volume and velocity of the blood currents in all the peripheral arteries are lessened; the blood being to a great extent shut off from the capillaries, the chemical processes of textural nutrition and transformation are partially suspended, and hence that chemical blood-moving force which is exerted within the area of both the pulmonary and systemic capillaries, and to which the heart's actions are responsive, being in comparative abeyance, this negative state, in conjunction with the vasic spasms, necessarily induces a slow and increasingly feeble pulse; and as the function of respiration is indissolubly associated with that of circulation, it must, irrespective even of the state of the medulla oblongata, also become gradually slower and more labored, and finally irregular and gasping, until at last it ceases altogether.

In man, the high degree of development of his



nervous system, and especially the large size of his brain, must, to a considerable extent, mask the action of opium on the spinal cord; but in animals, in proportion as the spinal or automatic nervous system predominates, the paramount action of the drug on that system becomes manifest.

In fishes and reptiles, convulsions are among the first notable symptoms which opium induces. In frogs, evidence of the most extreme action of the spinal cord—viz. *tetanic* convulsions—is the result of the administration or application of opium. In eleven out of twelve experiments by Dr. Anstie on dogs, cats, and rats, large doses of morphia caused convulsions in one shape or another. “The violence of the convulsions, and the frequency of their recurrence, was proportionate to the largeness of the dose.” Children resemble the lower animals more than adults do in respect to the great relative predominance of the spinal cord, and of those nervous centers which preside over the vascular system; and, accordingly, in them coma, with clonic convulsions, is induced by opium with great rapidity. The lower races of men occupy positions between those of children and adults of the Caucasian race, and it appears that opium produces convulsions more frequently in the negro, the Malay, and the Javanese, than in the European.\* Convulsions induced by opium in European adults are, however, met with oftener, perhaps,

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\* Pereira's “Materia Medica,” Vol. ii. part ii. p. 2108.

than is generally supposed. Professor Christison has recorded several cases.\*

There are good reasons for believing that when, in cases of disorder of the nervous system, the pupil is dilated, the chief seat of irritation and congestion is in the spinal cord and collateral ganglia of the sympathetic; and that when, in cases of narcotic poisoning, the pupil is dilated, those parts are implicated in a paramount degree, the cerebral blood-vessels being relatively less distended than those of the spinal cord and sympathetic. Now, in many animals poisoned by opium, dilatation of the pupil occurs at a much earlier stage of narcosis than it does in man; in the cat, a poisonous dose of opium “invariably causes wide dilatation and immobility of the pupil *at once*, while the other paralyzing effects on the nervous system are developed in a far more leisurely manner; for instance, the animal retains consciousness for a long time after the dilatation of the pupil—a state of things the very reverse of what happens in adult men, though *I have seen it occur more than once in young children.*”†

The comparative earliness of manifestation of stupor in cases of opium-poisoning is, I believe, determined by the comparative ascendancy (activity as well as size), and, therefore, vigor of circulation in

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\* *Vide* “Christison on Poisons,” p. 707 (Fourth Edition), cited by Dr. Anstie.

† “Stimulants and Narcotics, their Mutual Relations.” By F. E. Anstie, M.D., p. 231.

the cerebrum. The more active its functioning power, the more rapid and intense the chemical transformations of its vesicular matter, and, therefore, the fuller and stronger the blood-currents to and from it. Hence it is that as the paramount or most active nervous center attracts blood (and in cases of opium-narcosis the poisoned blood) most copiously and speedily, it becomes poisoned first; and hence it is that the evidence of the poisonous influence, viz., stupor, appears earliest in the highest organism—the Caucasian adult, and, in vertebrate animals, relatively to the other symptoms, later in proportion to their lowness in the scale of development.

Birds, however, occupy an exceptional position: not only does the general circulation of the blood attain in them its maximum degree of rapidity, but, corresponding to the extraordinary amount of their intelligence relatively to the size of their brains, the cerebral circulation is peculiarly quick and vigorous. Hence, as might be expected, when birds are subject to the poisonous influence of opium, stupor is induced in them earlier, relatively to the other symptoms of narcosis, than it is in most of the mammalian tribes, although the latter rank above them in the order of general development. In respect to the law in question, birds are an example of the common saying, "Exceptions prove the rule," which is also fully borne out by the order of manifestation of the cerebral symptoms of opium-poisoning in man: in the adult, stupor is one of the earliest phenomena; in

children, consciousness is retained relatively much longer—in some cases, as already stated, for a long time even after the pupil has become dilated.

In interesting accordance with the view of the facts just presented are certain others, the conjoint significance of which has, I believe, been only partially appreciated, and the right understanding of which will result in important therapeutical consequences: *First*, patients suffering from copious hemorrhage can take an extraordinary quantity of alcohol or opium, not only without experiencing the usual poisonous effects of either the one or the other on the brain, but with positive benefit. *Second*, patients suffering from delirium tremens can often take an extraordinary quantity of alcohol or opium, not only without experiencing the usual poisonous effects of either the one or the other on the brain, but with apparent benefit, including the induction of sleep. *Third*, other patients suffering from the same disease may take the same quantity of alcohol or opium, not only without producing sleep or any apparent benefit, but may seriously increase their malady. *Fourth*, other patients suffering from the same disease may take large and repeated doses of opium, and, while wholly failing to induce sleep, may “die from collapse almost as suddenly as if they had been shot, or had swallowed a large dose of prussic acid.”\* *Fifth*, in cases of tetanus, doses of

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\* “It has happened to me, as I doubt not it has to others, to see patients suffering from delirium tremens, who had been in-

opium large enough to kill healthy persons may be administered without producing apparently any narcotic symptoms whatever. Now, if I read these facts rightly, their meaning is as follows:

*First Case.*—When there has been great loss of blood, the brain, which relatively to its bulk receives the largest supply, feels the drain the soonest, and ceases its functions earlier, therefore, than the automatic nervous centers do; hence, with respect to its functioning power, it is temporarily degraded to a position, relative to those centers, analogous to that permanently occupied by the brains of the lower vertebrata, and hence convulsions are readily induced; therefore alcohol, by virtue of its special power of attracting blood to nervous tissue, exerts a beneficial influence by restoring blood to the brain, which, being previously bloodless, permits the continuance of that influence for a long time without the production of its usual consequence—cerebral congestion.

*Second Case.*—The phase of cerebral congestion induced by alcohol having been passed through, and the sympathetic nerve being now under the influence

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judiciously pressed with large doses of opium, because smaller ones had failed to procure sleep, die from collapse almost as suddenly as if they had been shot, or had swallowed a large dose of prussic acid, most obviously from the effects of the medicine. Dr. G. Johnson, who has kindly favored me with his views on this subject, insists very strongly on this evil influence of large doses of opium in delirium tremens."—*Anstie on Stimulants and Narcotics*, p. 170.



of the poison, its hyperæmic state causes contraction of the cerebral arteries, and therefore cerebral anaemia. Fresh draughts of alcohol, or full doses of opium, restore the attractive force of the brain tissue for blood; and as the sympathetic nerve centers are not yet so completely under the toxic influence as to counteract that force by inducing irresistible contractions of the cerebral arteries, the blood flows in them in fuller streams than before, and thus the famished brain receives new nourishment, and assumes the state associated with the process of nourishment—the repose of sleep.

*Third Case.*—The poisonous influence of the alcohol has now acquired such an ascendancy over the vaso-motor nerve centers that further supplies of alcohol, or full doses of opium, not only fail to re-establish that condition of the cerebral circulation constituting the ordinary initial stage of alcoholic effects, but the cerebral arteries are so closely clasped by their muscular coats as to prevent even that moderate flow of blood through the brain which is essential to that process of nourishment forming a part of the function of sleep. The force of the poison being chiefly expended upon, or rather manifested by, the sympathetic, its action is disproportionately intensified, and the malady therefore is in the same degree increased.

*Fourth Case.*—It is obvious that, if the condition just described were heightened but in a slight degree, the brain would be deprived of blood to an extent incompatible with the continuance of its life:

and as simultaneously the nourishment of all the other organs of the body is being shut off from them, though in lesser degree than that of the brain, the conclusion is inevitable that such patients, "injudiciously pressed with large doses of opium, because smaller ones had failed to procure sleep," must "die from collapse almost as suddenly as if they had been shot."

*Fifth Case.*—Tetanus is a disease consisting primarily of hyperæmia, and, in advanced stages, of inflammation,—proceeding even to disintegration of the spinal cord. Now, as I have already said, when a certain condition of defect or excess of blood has been induced in any given segment of the nervous system, a like condition, though less in degree, will be assumed by the proximate segments. Thus it is, that in cases of tetanus, the excessive hyperæmia of the spinal cord is partaken of by the collateral ganglia of the sympathetic, and hence, associated with the tetanus of the voluntary muscles, is a tetanoid condition of the involuntary muscles, and most especially of those governed by those ganglionic centers ranged most closely along the spine. Now the upper part of that chain of ganglia governs the cerebral arteries, which therefore are spasmodically contracted, and held so firmly in the grip of their surrounding muscles, that even under the strong stimulus of large doses of opium the cell-tissue of the brain is powerless to attract blood through them in currents of sufficient volume to produce cerebral hyperæmia—the first stage of opium-poisoning, while

the intense irritation arising from the diseased state of the cord is propagated to the brain to such an extent as to prevent sleep. Of course, though in these cases "doses of opium large enough to kill healthy persons may be administered without producing apparently any narcotic symptoms whatever," the drug is not inoperative: its influence on the brain is counterbalanced, and so far the exertion of its narcotic power is masked; but its influence on the sympathetic and on the spinal cord is in no degree opposed. On them it expends its full force, and, hidden from physical vision by co-operating with and intensifying the disease, hastens the death of the patient.

Clinical records abound with evidence which might be cited in support of the doctrine here announced, viz., that in cases of undoubted spinal hyperæmia, or congestion, the administration of opium does but increase the symptoms and the danger. Three such cases have just been published. They are so remarkable and instructive, that I am tempted to give an abstract of the reports of them:

*Case A.*—A young woman, eight months pregnant, who experienced a shock from the unkindness of her friends, complained on the 26th of the month of constant twitchings of the muscles of the arms and legs, with an evident inability to control their movements, sleeplessness, rather severe frontal pain, considerable heat of head, quick pulse, slight thirst, and some difficulty of speech and deglutition. On that day she was ordered "six leeches to the tem-

ples, to be followed by cold lotions to the head, purgatives, and milk diet. Next day, the 27th, she was evidently worse, excepting that the leeches had relieved the pain in the head." Then she was ordered "a steel mixture, and *two opiate draughts, each containing half a drachm of tinctura opii*, one to be taken at bedtime, and repeated if necessary.

"28th.—The jactitation of the limbs is increased in severity, so that four strong women can scarcely keep her in bed." In the hope of mitigating the nervous symptoms the induction of premature labor was decided upon (would not this have increased the spinal irritation?), and as a preliminary chloroform was administered (further congestion of the nervous centers). Labor was found to have begun without artificial aid, and was completed. "After delivery no diminution took place in the jactitatory motions, and," says her medical attendant, "I prescribed *two grains of acetate of morphia*, to be given in divided doses until sleep was induced.

"29th.—Has had no sleep, though she took the whole of the morphia. Her condition remains unchanged. Prescribed *full doses of chlorodyne*, with the hope of producing sleep, but it took no effect, and she gradually sank exhausted, and died at two o'clock on the morning of the 30th."

The post-mortem examination revealed "the membranes of the brain rather congested," and evidence of acute, destructive inflammation of the spinal cord.

Now I beg to submit for the consideration of the profession the question, Was not this a case in which

mere hyperæmia, not exceeding the limits of transient congestion of the spinal cord, was developed into fatal myelitis by the free administration of opium, morphia, and "full doses of chlorodyne"?

*Case B.*—A widow, aged thirty-three, who "had no appearance of being seriously ill," was admitted into a hospital on the 12th of the month. "She stated that she had suffered for six months from indigestion, brought on by worry and overexertion. The last eight days she had been very sick, vomiting up all her food. . . . Tongue coated; is very thirsty; bowels relaxed lately; urine dark colored; pulse very weak and small. She feels very weak; is almost ready to fall when she stands up; has much flatulence." She was ordered *brandy* and milk at short intervals, *ice to suck*, and beef-tea.

"On the 13th, as the sickness was not better, she had five grains of calomel, and a sinapism to the epigastrium.

"The next day there had been no action of the bowels, and *Indian hemp* was ordered, *gr. ½ quater die*.

"15th.—Is less sick.

"17th.—Not much sickness; bowels not open; skin cold; and pulse extremely small and weak. . . . Feet rather cold; is lying lightly covered; complaining of having been too hot; face looks quite rosy and well. . *Brandy 5 oz.*

"19th.—Was yesterday apparently moribund and almost pulseless; eyes venously injected; hands cold; but quite conscious. Had vomited a large



amount of dark liquid stuff. Ordered *opii gr. 4, 2 dis horis*. To-day, contrary to all expectation, she is still alive, quite conscious and rational, but in the same state of utter collapse and pulselessness; hands livid and cold; their temperature  $71.5^{\circ}$ ; that of axilla,  $92^{\circ}$ . . . . She was now packed in a hot wet sheet, but no good effect was produced; the fingers turned blue, and the circulation gradually ceased. Death occurred at 8 P.M. *Brandy had been given freely during the last twenty-four hours, besides claret."*

The post-mortem examination revealed nothing which could be regarded as an adequate cause of death. The physician who attended her observed: "It seems impossible to account for the gradual failure of the circulation on the view that the strength was exhausted by the vomiting, for this was certainly by no means so frequent and distressing as it is in many cases which are in no peril. . . . The duration of the malady was far too long to admit of its being ranked as a case of ordinary choleraic affection; nevertheless it seems to me most probable that the collapse was produced by some toxic influence acting on the nerves of the heart and arteries similar to that of the epidemic disease."

Holding the views I do concerning the nature of cholera, and the *modus operandi* of alcohol and opium on the automatic nervous centers, it seems to me probable that the "toxic influence" to which the collapse is ascribed was exerted by the free

administration of brandy and opium to a patient whose spinal cord and sympathetic nervous system had already become hyperæmic, and, therefore, peculiarly susceptible to their action.

*Case C.*—A man, aged sixty, admitted into hospital on the 13th of the month, and attended by the physician who had the care of the patient just mentioned, “was taken ill on the 9th with pain in his bowels, which has continued ever since. At present he is very prostrate, with cold skin, thready, scarcely perceptible pulse, coated tongue, hiccough, frequent vomiting, which he has had four days, while the bowels have been confined during the same time. The abdomen is distended, is dull in the depending part, resonant in the upper; the pain in it has diminished to-day. *Opii gr. ¼ o. horâ ad vices iij. Brandy every quarter of an hour.*

“14th—Was very sick part of previous evening; remains in same state as yesterday, except that diarrhœa has come on and is almost constant since 10 A.M.; it began at 6 A.M. Stools fluid, bilious, and offensive. Sickness has been checked by *repeated doses of chloric ether*. Pulse barely perceptible; tongue extremely coated; body exhales a cadaverous odor; is quite conscious, but can scarcely speak; died soon after.

“At the post-mortem examination nothing whatever was found to explain the symptoms.”

It is to be regretted that the amount of brandy given in the two last cases is not, except on one occasion, stated.

The physician observed, "The resemblance of this case to choleraic disorder is sufficiently apparent, and as it occurred at the same time as the one first related, there is some additional probability that both were of the same nature," *i.e.* due to the same "toxic influence." Whatever that "toxic influence" may have been, it is quite clear that neither brandy nor opium availed in the least to arrest the disease, and that from the hour they were given death advanced in this case as well as in the other, with increasingly rapid strides.

In conclusion, I will state my experience in treating one case of cholera by means of ice.

Mrs. D. was attacked March 12th, 1865, with diarrhœa. The fæces consisted of dark fluid, containing hard scybala. The malady continued throughout the following night.

On the 13th the dejections, which were still frequent, became of light color, exclusively fluid, and small in quantity. In the hope that the excessive action of the bowels was a beneficent effort of nature to clear out long-continued obstructions, nothing was done to stop it. During the night of the 13th the patient got up to stool several times, became alarmingly weak, and suffered much.

March 14th, early in the morning, I was summoned. Just as I reached the room, at 7.30 A.M., the patient's bowels were moved again. Immediately she had risen from the night chair she stood still and anxiously beckoned to her attendant, who

rushed to her and caught her just as she was falling. We got her on the bed, where she lay for some time as if dead. Having opened the window, I raised and held her up, when she soon recovered. At 8 A.M. she had another motion, when she lost the power of breathing. She tried to gasp; her face became quite dark colored, and remarkably pinched and contracted; her hands were dark-blue, and icy cold. Succeeding at length in her effort to articulate, she shrieked, in agony and terror of death, "Lord, save me! Lord, save me!" At last, though I feared she would sink, the struggle for life proved victorious, and she was then got into bed.

Not until 8.30 A.M. was it possible to procure ice. I applied it immediately, *and within five minutes she was in a placid sleep!* She slept forty-five minutes, and was then woke up by the leaking of the bag.

She had another motion immediately—nothing but a serous-like fluid, with flakes of mucus floating in it—a true "rice-water stool." I gave her a dose of chalk mixture; it speedily came up again. She vomited repeatedly.

As she was menstruating, and, only a few days before, had had a severe attack of hæmoptysis, I dared not use the ice freely and continuously along the whole back, as I otherwise should have done. But I used it so far as was necessary to keep the vomiting subdued; and whenever the vermicular movement of the bowels became distinct and con-

siderable, I arrested it by applying the ice for short periods at a time in the dorso-lumbar regions.

Thus the malady which, owing to the state of the lungs and womb, could not be suddenly cut short, was gently and gradually subdued. But the patient continued fearfully weak during the 15th, 16th, and 17th, although the choleraic symptoms were completely controlled. Indeed, she was so weak, that almost every time she was raised up or her bowels were moved, she became unconscious, and often lay as dead. Several times I was suddenly summoned when her attendants were helpless, and frightened lest she was on the point of death. On one occasion I found her lying on the floor of the room, pallid, unconscious, with a pulse scarcely perceptible, all the muscles relaxed—a dead weight, which the three women surrounding her could not lift into bed.

The treatment of this case was peculiarly difficult: the stomach would retain nothing, so that I could not avail myself of the aid of medicines, even had I known of any which I could have given with confidence that they could do good; much blood had recently been lost from the lungs, and was still being lost from the womb by excessive menstruation; ice along the whole spine continuously would probably have caused the hæmoptysis to recur, and would certainly have increased the menstrual flow: hence, though ice, freely applied, would have promptly arrested the choleraic symptoms, and would, by increasing the flow of blood in the peripheral arteries,



have prevented the frequent fainting fits which occurred, I could only use it safely during a few minutes at a time. But no witness of the effects of the ice in subduing the arterial spasms, on which the coldness and dark discoloration of the skin, especially of the face and hands, depended; in subduing the muscular contractions, which caused the pinched and sunken aspect of the countenance; in stopping those vigorous vermicular motions of the bowels, which the patient described as like the wavy movement to and fro of a live object against the inner wall of the abdomen, and which resulted in the perilously rapid expulsion of their contents; in stopping the vomiting; and, above all, in dispelling, as if by magic, the remarkable anxiety which was evinced, and in quickly soothing the patient into refreshing sleep,—could fail to become convinced that at length we have gained possession of a weapon with which we may fight successfully the battle of life, even with that awful destroyer the mere report of whose invasion is the terror of nations.

## POSTSCRIPT.

Many months ago, Mr. David Mark Williams, Honorary Assistant Surgeon of the Liverpool Infirmary for Children, applied to me for information concerning my method of treating disease by controlling the circulation of the blood in different parts of the body. In the course of my reply I urged him to avail himself of the opportunity afforded him at the Infirmary for Children, to try the efficacy of the spinal (hot) water-bag in inflammatory affections of the chest, and that of the spinal ice-bag in cases of diarrhœa, and to favor me with a report of the results. He procured a few of the bags of various sizes, and now has just sent me the following important letter, which he permits me to publish :

“WESTPORT, IRELAND, August 14th, 1865.

“MY DEAR SIR,—As you wished me to send you a history of a few cases of diarrhœa, etc. treated by *ice*, I hasten to do so while here for a few days.

“*Case 1.*—July 12th, 1865, I was asked to see George B., aged eighteen months, who, I was told, had been ailing for some time, but was now suffering from severe diarrhœa. On the second or third day of my attendance vomiting came on. Astringent mixtures, etc. were now given, with little or but temporary improvement; and by the 28th serious fears for the child's life were entertained by the parents.

“On the morning of this day I stopped all medicine, and ordered *ice* to the spine for half an hour. At 1 P.M. the parents had some confused idea that the cold had caused the child to faint; but I ordered the *ice* to be again applied for half an hour, the child being wrapped up in a shawl meanwhile.

“6 P.M.—While the ice was on, the child became quite warm, and free from pain, and in fifteen minutes was asleep, whereas it was crying bitterly before the application. It has not vomited since 3 P.M. Bowels still purged. The ice to be applied at 9 P.M.

“29th, 10 A.M.—After the ice was applied last night, the child fell into such a comfortable sleep that the parents would not disturb him, and the bag was left on until he awoke at 7 A.M. this morning. An hour afterward the bowels were moved once—a tolerably firm stool.

“Nothing more was done; the child remained quite well when I left home, August 9th.

“*Case 2.*—E. H., a girl thirteen months old (whose mother is an intimate friend of the child who is mentioned as Case 1), suffered from diarrhœa, was treated with ice twice a day and recovered. But as medicine was given and the gums were lanced at the same time, it is not so striking a case. Yet my opinion (and that of the parents) is that the ice greatly assisted us.

“*Case 3.*—July 28th, 1865, J. J., male, aged thirty-seven, was attacked with summer cholera. I

saw him first on the 30th. He was then so bad that I should have considered the cholera Asiatic, but for the bile vomited. He had three doses of chlorodyne to relieve the cramps, and ice was applied to the spine. He was quickly relieved of the vomiting and purging; but the cramps were very troublesome on the 31st. He applied the ice three times, for an hour each time.

“August 1st.—Cramps gone; skin warm, bowels not moved; no vomiting; but the patient continues thirsty. Nothing further was done, and he was quickly quite well.

“I have frequently used cold to the spine as an aid, sometimes by sponging and so on (not having the bags at home), and I think with great benefit, but I never used it alone until in the case (1) of George B.

“The hot water bag I constantly use in bronchitis, pneumonia, etc., with, I think, advantage; but then I give medicine. If I should attempt to treat with *cold* or *heat* ALONE I will keep careful notes, and send you the history. In the mean time I hope these memoranda will be of use to you.

“I am, my dear Sir,

“Yours sincerely,

“D. M. WILLIAMS.

“TO DR. CHAPMAN.”





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